Forests for Tomorrow

MOUNTAIN PINE BEETLE and WILDFIRE

SURVEY METHODOLOGY

Draft September 10, 2007

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1 INTRODUCTION

1.1 General: The Contractor will ensure he has reasonable access to a copy of his contract and the pre-work documentation during the course of carrying out the services to the Company.

1.2 Ministry Standards: Wherever this standard conflicts with a Ministry Survey Standard, this standard shall supersede the Ministry Standard.

1.3 Project Purpose: The project purpose is to identify "treatment areas" on crown land that would otherwise remain under-productive for timber, wildlife, habitat or water. While the primary program focus is on timber production, secondary consideration is also given to wildlife habitat and watershed restoration.

1.4 Project Scope: Field surveys will be conducted to identify "treatment areas" (Not Sufficiently Restocked – NSR) in immature and mature fire and MPB impacted stands. Results from these surveys will be used to support treatment prescriptions to regenerate candidate stands.

1.5 Project Area Manager: Project Area Managers are Registered Professional Foresters (RPFs) who will oversee operations for each Project Area and sign and seal the surveys and prescriptions for that area.

1.6 Survey Crews: Survey crews will consist of 1 or more persons, but generally 2 or 3. Survey crews will include certified surveyors and/or qualified surveyors with support from junior surveyors. Certified Surveyors will be assigned to each Project Area.

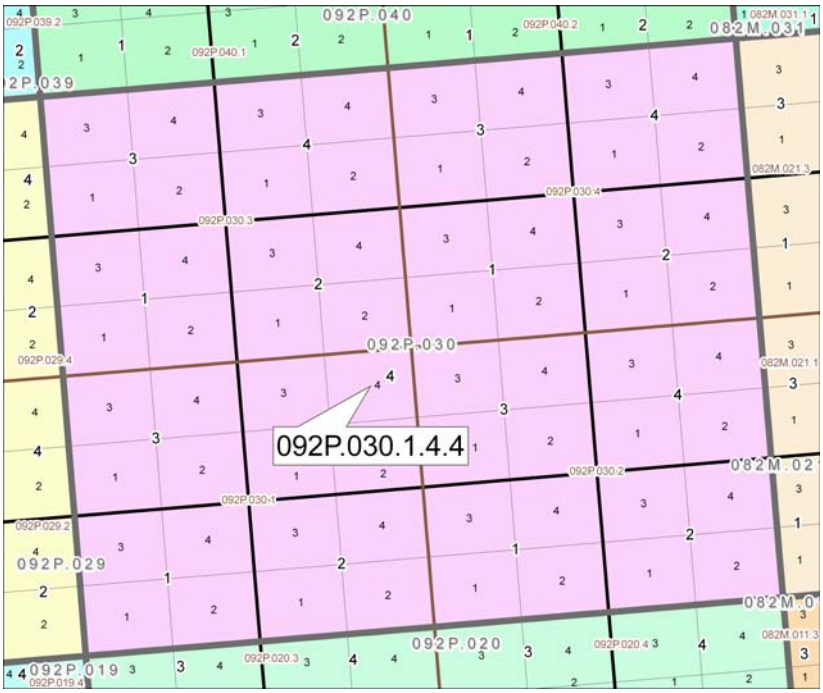
2 OFFICE PLANNING AND PREPARATION

2.1 Net Downs for Mountain Pine Beetle (MPB) and Wildfire Survey Areas: The Company will net down the TSA landbase to produce a Net Area within which to consider surveys. Once the Net Down is completed, a set of criteria will be applied to the Net Down Areas in order to prioritize areas for surveys. Some of the general prioritization criteria are: Pli as a leading species (minimum % composition), stand age, site index, Mountain Pine Beetle Incidence, Fire Boundary.

2.2 Potential Survey Units: Potential Survey Units are identified at the Timber Supply Area (TSA)/Tree Farm License (TFL) level based on the prioritization criteria applied to the base data. If the Forest Cover Polygon meets the criteria, then it is identified as a Survey Unit. Adjacent polygons are combined into one Survey Unit.

Survey units may be named by means of a "quadrant" location system with the following convention: (1:20,000 Map sheet/ 1st quadrant/ 2nd quadrant/ 3rd quadrant/ Unit) i.e. 82L092-3.2.1.a

The naming convention is based on Mapsheet + Quadrants to 1:2,500 (i.e. 82L024.1.1.1.A) + an alpha unique identifier for potential survey polygons. The entity MapBook is currently the primary key given to this naming convention. The image below shows the numbering scheme of the quadrants and provides an example for the naming convention down to the last quadrant division which is approximately 250 ha in size.



2.3 Project Areas: Project Areas are subsets of the Recipient's TSA/TFL. MPB Project Areas are identified based on locating a large pool of potential survey units within one geographic area, often at the watershed level. Wildfire Project Areas are defined based on the Wildfire boundary.

2.4 Preliminary Office Overview Assessment/Deliverable: Once a Project Area has been defined, overview maps are created (suggest a scale of 1:30,000). Once the Project Area Map is created, a preliminary office overview assessment is completed to remove any areas that are not suitable for treatment. There are various reasons for this net down including: survey units which are too small and remote, too steep, private land access issues, etc. Once the Survey Units have been confirmed or rejected, the Survey Unit Maps are ready to be created.

The map including areas netdown and the reason will be included in the final project deliverables.

2.5 Survey Unit Maps: Survey crews will be provided with Project Area Maps for access purposes. Survey unit maps will be provided at a suggested scale of 1:10,000. There may be 2 formats for survey unit maps, one with ortho background (if available) and one without. The map without ortho coverage is provided as a clean map base on which to stratify the block and write walkthrough notes upon.

2.6 Stocking Standards and BioGeoClimatic (BGC) Ecosystem Classification (BEC): Prior to beginning field work on a survey unit, the BGC Zone/Subzone/variant will be identified based on the BEC Map for that area in conjunction with any other local knowledge that is available (knowledge of the area, adjacent prescriptions/plans, etc.). This will help identify the target stocking standard which is derived from the BGC Site Series for that Stratum and the associated stocking standard from the "Reference Guide to FDP Stocking Standards", Dec 11/02 (http://www.for.gov.bc.ca/ftp/hfp/external/!publish/Stocking%20Standards%20for%20FDPs).

2.7 BGC Site Series: The site series is to be confirmed on site. Site series having the same stocking standard may be grouped together. This will minimize the number of strata. In these situations note the various site series within the stratum as a percent.

3 WALKTHROUGH ASSESSMENTS – PROCEDURES/DELIVERABLES

3.1 Walkthroughs: Initially, a walkthrough assessment is to be carried out on all survey units to determine if there is any potential treatment area within the survey unit. The walkthrough assessment will be supported by the 1:10,000 scale maps provided. During the walkthrough, the surveyor is to identify on the field map all potential treatment and non-treatment areas. Non-treatment areas will have a minimum amount of field data collected for the site/stand which primarily consists of a rationale for no treatment and a brief site and stand description. As there will be no treatments prescribed in these areas, stratification is not required for areas less than 5 ha

3.2 No Treatment Rationale: Areas identified at this stage as not being suitable for a treatment will not be assessed further. The surveyor will note the reason(s) why a stratum is not suitable for treatment using the following as guidance:

- Potentially Stocked (Sufficiently Restocked – SR)
- <2% ROI
- Poor access
- Excessively steep slopes (>= 80%)
- NP (swamp, rock, etc.)
- Mature timber with viable salvage opportunity
- Licensee Cut Block (i.e. Marked boundary or recently logged)
- Exceeds minimum Basal Area (BA) for SR (based on DFP Survey Procedures)
- Other

- **Walkthrough Stratification:** During the walkthrough, the surveyor is to map strata boundaries as accurately as possible. A Stocking Assessment will then be completed within the Potential Treatment Areas only.

  The minimum Potential Treatment Area required to be identified before a Stocking Assessment is initiated in any given survey unit will vary from site to site and Project Area to Project Area depending on a number of factors including:
  -current access and required access improvements
  -adjacent treatment area(s)
  -ROI (the better the ROI, the more that can be expended on access improvements, stand treatments, etc.)

  Within a potential Treatment Area, the minimum stratum is 1 ha (which includes both Treatment and No Treatment areas).

3.3 No Walkthrough Assessment: If the surveyor is unable to complete proper stratification of the potential treatment area via a walkthrough, they are to move directly into a Stocking Assessment. This applies to many of the wildfire units where visual stratification is inhibited by brush and the size of the regeneration.

3.4 Walkthrough Assessment Deliverables: Three hard copies and one digital copy of the following:

- Maps showing strata boundaries and surveyor's assessment path

- Walkthrough Summary of non-treatment areas and decision rational for treatment areas or areas prescribed a stocking assessment.

4 STOCKING ASSESSMENTS – FIELD PROCEDURES

4.1 Survey Methods - Generally: Stocking Assessment methods generally include single-layered, multi-layered and Deviation from Potential (DFP). Field information will be gathered by layer on all Survey Units. In single Layer stands, survey summaries will be provided as one layer. In multi-storied stands, survey summaries will be completed by layer. DFP assessments will be completed on all survey units.

4.2 Sampling Intensity: The sampling design and intensity for Potential Treatment Areas will be driven by the degree of variability and complexity found in the stratum. Increased stratum variability and complexity typically will require more sampling. Sampling design and intensity will be determined after the walkthrough assessment has been completed.

Plot intensity will range from 1 plot/ha to 1 plot/5ha with a minimum of 5 plots/Stratum. Regardless of the plot intensity, the surveyor must ensure that their plots locations provide uniform coverage of the Stratum. This process will help ensure the plot data is representative of the whole stratum.

4.3 Systematic Random vs Representative Sampling: Systematic and representative sampling methods are both acceptable survey approaches under this project. With systematic sampling, all plots are to be established on a predetermined grid, the spacing for which will be dependant upon the survey intensity. Representative Sampling requires significantly more expertise and experience and is not to be undertaken unless approved by the Recipient. If representative sampling is employed, the surveyor is to select the plot locations based judgement to ensure that each plot is representative of the Stratum.

4.4 Dispersed Stratum: In the case of a dispersed stratum that cannot be easily mapped, the surveyor is to provide descriptive notes to better describe the stocking and the inventory. The estimated area must be established for each of the dispersed Strata.

4.5 Statistical Calculations: Statistics are to be calculated on all single–layered Stratum (single storied and multi-storied stands as defined by the Stocking and Free Growing Survey Procedures Manual, May 2002). This information will be used to help quantify and qualify the reliability of the stocking information but will not be used to help make a Stocking Status decision.

5 STOCKING ASSESSMENTS - DETAIL

5.1 POC: The POC is to be clearly marked adjacent to the survey unit at a photo identifiable point, which may or may not be along the access road to the survey unit. The survey date, unit identification, crew, and “FFT Surveys” will be noted on the POC ribbon.

5.2 Strip lines: Strip lines (paths of travel) do not need to be flagged if the plot locations are identified by GPS coordinates. If GPS is not used, adequate strip line flagging is required.

5.3 Plot Location: Handheld GPS units are advised for this project and should be used to locate all plots. Hip chains are not required if GPS plot location is used. Once the surveyor reaches the pre-determined UTM grid location (or appropriate bearing and distance "GO TO"), do not attempt to move the plot. Generally, handheld GPS units are only accurate to within 5-30m horizontally and therefore the plot centre will seem to shift. Once located, do not move the plot centre. In no case should plots fall within 60m of each other unless the Stratum is <5ha.

5.4 NP Areas: NP areas are not to be sampled (i.e. NP Rock, NP Swamp, NP road/landing). If a surveyor's pre-determined plot location lands in an NP area the plot is to be moved along the surveyor's line of travel in increments of 10m, until the full plot falls within the adjacent stratum. The surveyor is to type the NP area out on the map (sketched and labeled).

5.5 Plot Establishment and Marking: Plots should be established at the convergence of UTM points (i.e. UTM11N 5636700/302500) if GPS is chosen. Plots will be clearly identified with ribbon hung at approximately 1.3m above the ground, at or near the plot centre identified with plot number only. A ribbon is to be placed in the ground at plot centre or tied to a stick which is placed in the ground at plot centre. In addition, ribbon will be hung along the outskirts of the plot as high as possible, at 4 points/corners, for ease of detection.

5.6 Plot Size: A 3.99m plot radius will be used on all survey units.

5.7 Data Collection and Plot Card Entries: All plot card entries will use the following protocol to minimize confusion and assist others involved in compiling, entering and reporting of collected information.

5.7.1 **Plot Information**: The FS 658 plot card must be filled out with the information to be gathered at each plot. In addition, at every 4th plot/stratum (and a minimum 3 plots/stratum) more detailed information is to be collected as per the attached plot card. The plot card represents only a sample of the information to collect.

-sample trees by layer (per Surveys Manual)

-Competing Vegetation (species codes to follow the 4 character Latin name as attached to this Standard)

-Inventory Labels by layer (per Surveys manual, do not need to record age and ht of the second leading species)

-Stable snags, average height and dbh

-Unstable snags, average height and dbh

-Soil texture and coarse fragments

-Slope and aspect, alternatively, this information can be captured on the field map with a slope and directional arrow

-anything else the surveyor feels is warranted to be collected at this intensity to support your Stratum Summary and possible Treatment Plan

5.7.2 In many situations additional information may need to be collected to support an accurate stratum description, to clarify recommendations and to confirm prescriptions. This information is to be summarized and used for the site description on the 657 (to be completed for every survey stratum) and included in the Treatment Prescription/Plan (to be completed for all treatment areas).

5.7.3 **UTM**: If GPS is used, UTM locations will be noted beside each plot on the plot card.

5.7.4 **Numbering**: Plot numbers will be sequential and be identified by the surveyor's initials and plot number. For example, KL1, KL2, SB1, SB2…. This will provide immediate reference as to who completed the field work for each and every plot.

5.7.5 **Tree Recording**: In all stand conditions (single layer and mutli-layered) the "total trees" and total conifers are to be recorded for each Layer using the following categories:

- Layer 1 >= 12.5 cm dbh
- Layer 2 >7.5 cm dbh and <12.5 cm dbh
- Layer 3 >1.3 m ht and <7.5 cm dbh
- Layer 4 <=1.3 m ht and >=10cm
- Layer "G" (germinants) <10 cm ht (including deciduous)

At each plot the surveyor is to estimate the total number of germinants.

*This is not the standard survey method used in a single layer survey, however, the inventory label data will still be gathered as a single layer in these stand types, despite gathering total stems by layer. Total trees will be summed for the purposes of including it in the Inventory label.

5.7.6 **Well Spaced Stems** (WSS) Criteria: WSS criteria are per the Silviculture 2002 Survey Manual. All Layer 1 WSS trees have no minimum inter tree distance (MITD) requirement. All other Layers have a 2.0 m MITD spacing requirement for WSS, unless otherwise specified in the stocking standards.

5.7.7 WSS Recording: In all stand conditions the "Well Spaced Stems" (WSS) are to be recorded by species for each Layer using the following categories:

- Layer 1 >= 12.5 cm dbh
- Layer 2 >7.5 cm dbh and <12.5 cm dbh
- Layer 3 >1.3 m ht and >7.5 cm dbh
- Layer 4 <=1.3 m ht and >=10cm
- Layer "G" (germinant) <10 cm ht

*This is not the standard method used in a single layer survey, however, only one Silviculture label will be provided in the Survey Summary/Treatment Plan.

5.7.8 WSS Germinants: WS germinants (G) are to be assessed in the same manner as any other WSS with consideration to spacing, health and vigour. **This needs reflection as not favored by all areas.**

5.7.9 **Tallying WSS**: WSS will be assessed from the top down and beyond the M value within a layer as well as cumulatively down through all the layers. WSS will be assessed and tallied in Layer 1 first. Next WSS will be assessed in Layer 2, respecting the WS Layer 1 stems. Next, layer 3 is assessed for WSS respecting the WS layer 1 and 2 stems, followed by the Layer 4 and lastly germinants.

Note: When summarizing the stocking status of a stratum the surveyor is to use "M" values.

5.7.10 **Marking WSS**: WSS will be marked with flagging in the field for ease of later identification. In the case of small stems (especially germinants) a ribbon will be dropped close to the WSS.

5.7.11 **Silviculture and Inventory Labels**: Silviculture and Inventory labels will be gathered and summarized by layer in multi-storied stands according to the normal procedure. In single layered stands, although total trees and WS will be tallied by layer, only one Silviculture and one Inventory label will be produced. The method for preparing these labels is according to the Stocking and Free Growing Survey Procedures Manual, May 2002.

5.7.12 **FG Stems**: All Well Spaced stems are to be assessed for their acceptability as a FG stem. The FG stems are a subset of the well spaced stems.

5.7.13 **Advance Regeneration Acceptability**: Advanced regeneration and poles (layers 2, 3, and 4) will be assessed for acceptability based on Sections 7e. and 7f. of the FS660 (01/05).

5.7.14 FG Opportunity (**Plantabe Spots**): Under this project plantable and preparable spots are referred to as the "FG Opportunity (FGO)". FGO is defined as the growing space necessary for establishing a FG tree with respect to the existing stand structure, tree size, and crown width within and outside the survey plot.

FGOs will be assessed at the target inter-tree spacing for the selected stocking standard for the site. A FGO exists for any potential productive spot which is at target spacing (i.e. 3.1m for a 1200sph target and 3.4m for a 1000 target) or greater, from any acceptable tree, regardless if it is well spaced or not, and the spot is outside the dripline of any live tree, other than a Pli (for MPB surveys only).

5.7.15 **Acceptable Trees**: All living coniferous tree species are to be considered acceptable and spaced off of when identifying the FGO spot. Two exceptions to this rule apply.

The first exception to this rule exists where there are green attack pine stems and the surveyor has determined the beetle is still active in the stand. In this case, all L1 and L2 Pli will be ignored for the purposes of assessing the FGO spot. Refer to the section specific to MPB Impacted Stands for more detail.

The second exception to this rule exists where a live conifer is taking the place of a FGO but that conifer is not expected to form part of the next merchantable crop, the spot may be considered preparable and coded with a "C" for conifer removal prior to planting.

All broadleaf tree species are to be spaced off of when they are designated as preferred or acceptable species in the stocking standard.

5.7.16 **Preparable Spots**: If site preparation of some sort is required in order to prepare the FGO spot for planting, these spots will be tallied in the preparable column and identified with a code related to what type of site preparation is required. Generally, site preparation will be required for improving seedling survival and growth associated with wet cold soils and excessive deleterious

brush cover, or excessive woody debris limiting planter access. Herbaceous brush is generally considered plantable as is. Use the following site preparable codes:

- B indicates a brush treatment is required prior to planting
- M indicates that microsite treatment is required to improve seedling survival/growth (ie. mounding, disc trenching, screefing)
- C indicates a tree removal treatment to increase reforestation opportunities
- S indicates slash abatement treatment

Where a decision is made not to prepare a site and go straight to planting where there are both preparable and plantable spots, the prescription is to describe why the preparable spots are being included in the plantable spots total. This rationale will clarify why the plantable spots are being considered as plantable while they were not at the time of the stocking assessment (eg. Spots are preparable due to the presence of unsuitable advanced regen but the prescription calls for planting beside these trees rather then a very costly prescription to cut these poorly performing trees down).

5.7.17 **Tallying FGO**: Tally the FGO plantable and preparable spots in the Layer 4 row on the 658. Tally the total number of available spots regardless of the M value.

5.7.18 **Basal Area Sweeps** – Dead and Live Trees: If directed by the Regional MoFR FFT contact, BA sweeps will be completed on all stands and at all plots with a BAF 4 for stems >=12.5cm dbh (Layer 1). Basal Area sweeps will tally the number of dead over the number of live stems in the "COUNT. CONIFERS" column, as a split box. Live trees include anything with >=90% of foliage as green and/or fading to red, including green attack. Live trees must be tallied by species (ie. 2 Pli, 1 Sx).

5.7.19 **Dead Trees Count**: If directed by the Regional MoFR FFT contact, a separate plot sweep will be completed for snags >5m in height. Tallies will be made for # of stable and # of unstable snags in the plot and tallied as a split box in the "COUNT.HEIGHT" column. Unstable snags will be assessed based on a Danger Tree Assessment for a Level 1 disturbance where unstable = dangerous and is defined as:

- insecurely lodged trees or hung-up limbs or tops
- highly decadent or unstable (e.g. >50% stem damage or >50% root damage)
- recent high lean (>15% toward work area) and damaged root system/anchoring soil layer

5.7.20 **Forest Health Assessment**: Forest health impacts will be assessed at each plot on all trees. Only those trees which do not meet the FG Damage Criteria will have causal pests/diseases noted. Wildfire impacts do not need to be noted in the forest health tallies as this is already quite obvious in the wildfire area. MPB impacts will be tallied by live = green attack and dead = red and grey attack (see section "Specific to MPB Impacted Stands" for more detail).

5.7.21 **Site Index**: Site Index is to be determined according to the following hierarchy:

- First. If the stand is a suitable candidate use the Growth Intercept method. If possible and necessary go to an adjacent stand to obtain a suitable sample for Growth Intercept. A dead managed stand sample is also acceptable for the

growth intercept. A minimum of three samples per stratum is required.

- Second. Use SIBEC second approximation for the appropriate species.
- Third. SIBEC first approximation.
- Fourth. Company's direction.

Surveyors must note the SI method employed on the summary card for each stratum using the following codes:

- Growth Intercept "I"
- SIBEC rollover "O"
- District Direction "S"
- Forest Cover G, M, P, L site classes

5.7.22 **Moisture Regime**: Moisture regimes will be noted at all plots as wet, dry or mesic. If the Site Series can be identified at that time, this will also be noted.

5.7.23 **Brush Hazard**: A "Brush Hazard Assessment" will be completed at all plots and noted as Nil, Low Medium or High. This assessment relates to the potential impact of the brush on the existing stand and has nothing to do with brush impacts on ingress or establishment. The Assessment is also defined as the impact to crop trees and the necessity for treatment (N, L, M or H) in Article 4.4 of the Ministry Survey Standard, April 1, 2007.

5.7.24 **Supporting Information and Comments**: Relevant site and stand comments are encouraged to be recorded at every plot in order to facilitate stratum summaries, recommendations and prescriptions later on.

5.7.25 **Other Information**: In addition to the information gathered at every plot and every 4th plot, additional considerations should be made during the walkthrough which may or may not be noted on plot cards or map:

- Observed or potential integrated use concerns (ie. range, recreation, and other resource value issues/concerns)
- Wildlife features
- Heritage features
- Environmentally sensitive areas
- Streams/Crossings and Riparian areas w/ respect to possible treatments
- Access limitations/restrictions/required upgrades

5.7.26 **Specific to MPB Impacted Stands:** Incorporate the following plot card entries/methodology for stands impacted by MPB. In these situations we will consider green attack stems (>= 90% of the foliage is green and/or fading to red) as live trees:

- Never accept a MBP/IBM affected tree as Well Spaced or FG
- MPB impacted trees will be tallied in the Forest Health columns by green = live and red and grey = dead.
- Include green attack pine in the inventory label for all Layers.
- Based on the surveyor's site assessment, if the MPB is still active in the stand and producing green attack (for example, >10% of all Pli stems is green attack), all Layer 1 and 2 uninfected live pine will be considered dead, therefore not considered as WS/FG and ignored when identifying Free Growing Opportunities (plantable/preparable spots)

- Note the dbh of the smallest pine impacted by MPB across the Stratum.

5.7.27 Photographs: A minimum of 1 overview photograph will be taken of every survey Stratum, with the photo location and direction noted on the map.

5.7.28 **FS657**: The FS657 front card and the Treatment Prescription/Plan should be filled out prior to leaving the survey unit to ensure that all necessary information has been gathered.

5.7.29 **Allowable Errors**: Survey field work shall not exceed the Allowable Errors as stated in the Stocking and Free Growing Surveys Procedures Manual, March 2002 and the signed agreement with the Company.

5.7.30 **Deviation from Potential Survey Data**: The DFP survey data is to be summarized in all stands with >= 5m2 live BA. The existing information being collected for the "stocking assessment" will meet the DFP survey requirements.

6 STOCKING ASSESSMENTS – DELIVERABLES

6.1 Stocking Assessment Deliverables: For each survey unit that received a Stocking Assessment, provide three hard copies and one digital copy of the following information:

- Maps, showing:
  - Forest Cover strata boundaries, POC, plot locations, and assessment path
- Strata boundaries
- FS 657, 658, and 659 cards
- Completed "Treatment Assessment/Plan"
- Completed IRR Worksheet and/or ROI field cards (if applicable)
- Planting Difficulty Rating Field Card or copy thereof
- FS 739 Planting Prescription for all treatment stratum

6.2 Professional Sign-off: All Walkthrough Assessments, Stocking Assessments and Prescriptions/Treatment Plans are to be signed and sealed by an RFP.

7 RETURN ON INVESTMENT (ROI) CALCULATIONS

7.1 ROI Responsibility: The Recipient is responsible to ensure an accurate ROI is completed for all sites leading to a treatment prescription. Each ROI must be completed by an individual who has taken the ROI training or who has been granfathered this certification.

7.2 ROI Calculations: Return on Investment calculations will be completed on all areas which received a Stocking Assessment which also resulted in an NSR stocking status according to the applied Stocking Standards for that site.

7.3 ROI Field Cards: The initial calculation will involve the simplified field cards on sites for which they are suited (primarily wildfire areas). The field cards are a coarse screening aid for determining whether stocking enhancements will generate at least 2% rate of return. Use the field cards if all of the following conditions are met:

- stand is predominantly even-aged, with little or no advance regeneration in excess of 1 m
- stand is ≤ 6 years old
- stand is currently comprised mainly of lodgepole pine, interior or Engelmann spruce, Subalpine fir, Douglas-fir and/or western larch

7.4 Species Selection: If there is no stocking on site (i.e. no well spaced), use the species that is recommended for planting on that site for the ROI Calculation, not necessarily the preferred species from the FDP Stocking Standards or what was growing on the site previously.

7.5 Expected FG: In order to determine the "Expected Well Spaced Stocking at Free Growing (untreated)" the following guidance is to be applied:

- well spaced/ha is calculated for the Treatment Area (Stratum), respecting "M"
- the potential for ingress is assessed and the estimated WS ingress is added to the current WSS/ha. This WSS/ha is then projected to the FG stage. This value may be adjusted down based on expected survival, therefore, consider the expected survival on this site as well as the opportunity for other stocking (not currently WS) to supplement the WSS/ha

7.6 Treatment Schedule and Costs: In order to assess whether a potential treatment area meets the 2% ROI, a treatment schedule with associated costs must be laid out. The treatment costs are derived from the "Wildfire Area Treatment Plan" and "Survey Standards, Article 3". Once a treatment regime is established its total cost per/ha can be determined.

7.7 Treatment Costs: The following activity treatment costs are to be used as a guideline in determining the overall treatment regime cost. Site specific treatment cost drivers should be considered in which case the costs below would be adjusted as required and rationalized within the prescription. Ranges below from the historic records for some activities.

Full Survey (regen & FG)	$20/ha
Walk through Survey	$10/ha
Brushing	$400/ha
Cabling	$300/ha
Bunching & Burn	$425/ha
Machine Falling and Crushing	$500/ha

- Planting $1,000/ha
- Fill in planting $600/ha
- Snag Falling (hand) $300/ha
- Snag Falling for density control $400/ha
- DT Assessment and Hand Falling $300/ha (not $540/ha)
- Layout $15/ha
- Mounding $700/ha
- Excavator Screefing $700/ha
- Disc Trenching $250/ha

	Surveys	Brushing	Fill Planting	Mounding	Site prep	Snag ass & fall
Average	$29.75	$828.40	$563.61	$882.04	$738.44	$422.75
High	94	1700	1300	1200	1500	720
Low	11	320	220	700	240	150
Median	**$25.66**	**$811.43**	**$498.25**	**$791.25**	**$594.27**	**$393.43**

7.8 Factoring Down Treatment Costs: Treatment costs can be factored down by treatable area.

Example:

100% of the Stratum is planned for planting	= 1.0 x $1000/ha
70% of the Stratum is planned for DTA and snag falling	= 0.7 x $300/ha
10% of the Stratum is planned for mounding	= 0.1 x $550/ha
10% of the Stratum may require Brushing in the future	= 0.1 x $400/ha
20% of the Stratum is planned for layout (mounding/brushing)	= 0.2 x $15/ha
100% of the Stratum is planned for surveys (x3)	= 3.0 x $20/ha
TOTAL REGIME COST (1000+210+55+40+3+60)	= $1368/ha

7.9 Dispersed Treatment Costs: Dispersed treatment costs for ROI calculations will be based on the actual ha to treat at the stated ha rates. For example, a 60 ha stratum contains dispersed snags equating to 1/3 of the stratum area. The snag falling treatment cost is estimated at $300/ha. The snag falling cost for the total stratum is: (1/3 * 60ha)* $300 = $6,000

7.10 ROI Field Cards: Where ROI Field Cards are applicable, the planned regime cost is compared with the appropriate ROI field card maximum expenditure for >=2% ROI.

If the planned treatment regime cost for the area is 0 - 5% above or 0 - 10% below the "Maximum Investment" $/ha value as determined from the field cards for the area, then the detailed "Internal Rate of Return" (IRR) excel workbook is to be completed. The detailed IRR workbook will determine if the 2% ROI requirement can be met.

If the planned treatment regime cost for the area is more than 5% above the "Maximum Investment" $/ha as determined from the field cards for the area, then no "Internal Rate of Return" (IRR) excel workbook needs to be completed. In this situation the treatment is a no go. If the treatment regime costs are more than 10% below the "Maximum Investment" ($/ha) threshold, then the treatment regime is a go and the field card resultant is used to support the treatment decision.

7.11 Internal Rate of Return (IRR): Where the ROI Field Cards cannot be applied, the IRR workbook will form the ROI Calculation.